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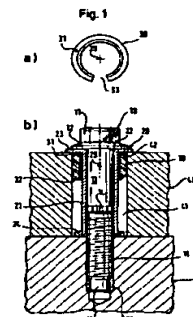
### (54) A fastening of an assembly part onto a carrier part

(57) A fastening of an assembly part on a carrier part with

- at least one fastening screw which comprises a screw head with engaging surfaces for a tool, a screw shank, at least one radial projection on the screw shank at a distance from the screw head and a thread at least at the distance of the radial projection from the screw head,
- with a sleeve with an inner diameter which corresponds at least to the outer diameter of the radial projection and of the thread, which is a narrow location with an inner diameter smaller than the diameter of the radial projection but at least as large as the outer diameter of the screw shank between the screw head and the radial projection, and which at the upper end comprises a head flange and at the lower end a foot flange into which the fastening screw is inserted, wherein the narrow location is snapped over the radial projection of the fastening screw and the screw head is allocated to the outer side of the head flange,
- with a flexible assembly ring whose inner diameter is smaller than the outer diameter of the head flange and foot flange and which is arranged between the head flange and foot flange on the sleeve,
- with a through-bore in the assembly part whose inner diameter is at least as large as the outer diameter of the foot flange, into which the sleeve is

inserted, wherein the lower side of the head flange is indirectly or directly supported on the upper edge region of the through-bore, wherein however the inner diameter of the through-bore is dimensioned such that the assembly ring is radially pressed together therein and by way of this clamped in and/or the through-bore comprises an undercut with an inner diameter so that the assembly ring under radial compression and subsequent expansion is pushed through the undercut and by which the assembly ring is retained in the through-bore, and

- with a threaded bore in the carrier part, into which is screwed the thread of the fastening screw and on whose edge region the foot flange of the sleeve is supported.



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## Description

[0001] The invention relates to a fastening of an assembly part onto a carrier part.

[0002] One possible application region of the invention is in automobile technology. A case of application is the fastening of the cylinder head cover to a cylinder head. Another is the fastening of an intake chamber to a motor.

[0003] Relevant fastenings with which a fastening screw is arranged telescopically in a sleeve, wherein a knurling of the screw shank at a distance from the screw head in cooperation with a necking at the upper end of the sleeve ensures an unlosability of the fastening screw and sleeve, are already known.

[0004] With one embodiment a head flange of the sleeve is supported on a rubber ring which is pressed into a receiver of a cylinder head cover. A foot flange of the sleeve is buttoned into a through-bore with an undercut of a further rubber part which is arranged between the cylinder head cover and the cylinder head. By way of this a decoupling is effected, i.e. the hard screw head as well as the sleeve are not pressed directly against the cover which may consist of plastic. On the other hand the sleeve of metal prevents an excess pressing of the rubber parts. With this an unlosable prior assembly of the screw, sleeve and rubber parts to the cylinder head cover is possible which permits a transport in any position up to assembly on the cylinder head. It is however of a disadvantage that the screw, when mounting the cylinder head cover, with its lower end may slide over the sealing surfaces of the cylinder head and damage these. With long screws the knurling may even press against the necking of the sleeve and loosen the prior assembly.

[0005] With another fastening likewise a rubber ring is arranged between the head flange of the sleeve and the assembly part. The rubber ring below has a collar with three hooks distributed on the circumference which engage behind the undercuts in a through-bore of the assembly part. The collar however must have a certain thickness so that on pressing into the through-bore they are not pressed axially together. Because the hooks form the only securement this fastening is not adequately safe in transport. Furthermore the telescoping ability is limited by the abutment of the knurling on the necking so that there prevails a relatively long screwing out of the sleeve and thus the guiding as well as the assembly of the cylinder head cover (assembly part) is made more difficult.

[0006] With another fastening the rubber ring is pressed into the assembly part at its large circumference. This sleeve may be arranged in the rubber ring with play so that it may be telescoped up to the abutment of its foot flange on a collar of the rubber ring. Since also the screw may be displaced with respect to the sleeve there results as a whole an enlarged ability to telescope which favours the application on a carrier

component. However the circumferential pressing does not ensure any particularly secure pre-assembly in the assembly part.

[0007] With yet another fastening, the foot flange engages behind several undercuts, which in a cover part are preferably injected from plastic. The manufacture requires complicated injection tools. Furthermore the undercuts on pressing in the foot flange may shear off so that the transport securement is not ensured.

[0008] Proceeding from this it is the object of the invention to provide a fastening of an assembly part to a carrier part, which improves the security of an unlosable pre-assembly, favours an assembly without the protrusion of the screw ends out of the assembly part and may be applied in the case of decoupling as well as in the hard screw case.

[0009] The object is achieved by the features of claim 1. Advantageous formations of the fastening are specified in the dependent claims.

[0010] The fastening according to the invention of an assembly part on a carrier part has at least one fastening screw which comprises a screw head with engaging surfaces for a tool, a screw shank, at least one radial projection on the screw shank at a distance from the screw head and a thread at least at the distance of the radial projection from the screw head. The radial projection may be formed from the upper end of the thread. Preferably however at least one special projection is present. With this it may be the case of a single projection which extends only about a part or about the whole circumference, or several radial projections which are distributed over the circumference of the screw shank, in particular in the form of a knurling.

[0011] Furthermore the fastening has a sleeve with an inner diameter which corresponds at least to the outer diameter of the radial projection and of the thread, which preferably at the upper end comprises a narrow location with an inner diameter smaller than the outer diameter of the radial projection, however at least as large as the outer diameter of the screw shank between the screw head and the radial projection. The narrow location may be formed by at least one radially inwardly protruding projection of the sleeve. Furthermore the sleeve comprises at the upper end a head flange and at the lower end a foot flange preferably with a smaller diameter than the head flange. Into the sleeve the fastening screw is applied wherein the narrow location is snapped over the radial projection of the fastening screw and is allocated to the screw head of the outer side of the head flange. The applied fastening screw may thus be axially displaced in the sleeve, is however unlosably retained therein by abutment of the radial projection on the narrow location.

[0012] Further there is present a flexible assembly ring whose inner diameter is smaller than the outer diameter of the foot flange and which is arranged between the head flange and foot flange on the sleeve. Preferably the assembly ring is elastic so that by broad-

ening, sliding over the flange, preferably the foot flange, and subsequent elastic retraction on the sleeve, it can be assembled on the sleeve. Between the assembly ring and the foot flange there may be present a radial play, by which means a compensation of tolerances and heat expansions is favoured.

[0013] A through-bore in the assembly part has an inner diameter, which is at least as large as the outer diameter of the foot flange so that the sleeve with the inserted fastening screw may be inserted into the through-bore. With this the assembly ring is pre-assembled on the sleeve. The inner diameter of the through-bore is dimensioned such that it radially presses together the assembly ring on insertion and by way of this is clamped in and/or the through-bore comprises an undercut with an inner diameter so that the assembly ring under radial compression and subsequent expansion is pushed through the undercut and by which the assembly ring is retained in the through bore. The through-bore may have the undercut at the upper end, which may clamp in the assembly ring in an intermediate position and/or after broadening retain it in a bordering bore section. In the bordering bore section the assembly ring may still be clamped in. The through bore may however have the same inner diameter everywhere so that it clamps in the assembly ring in every possible insertion location. The sleeve is supported with the lower side of the head flange directly over an elastic intermediate position on the upper edge region of the through-bore.

[0014] In the carrier part there is present at least one threaded bore into which the thread of the fastening screw is screwed in and on whose edge region there is supported the foot flange of the sleeve. The supporting of the assembly part may either be effected directly or via an elastic intermediate layer.

[0015] The fastening according to the invention, by way of the radial projection of the fastening screw and the narrow location of the sleeve, the arrangement of the assembly ring between the head flange and the foot flange and the clamping tight and/or the retaining of the assembly ring in the assembly part, favours unlosable pre-assembly. A protrusion of the fastening screw out of the assembly part is avoided since the fastening screw with respect to the sleeve as well as the sleeve with respect to the assembly ring may be telescoped. The fastening is suitable for the hard screw case as well as for an elastically decoupled screwing. Manufacturing and heat tolerances may be compensated for by play between the sleeve and assembly ring. The elements can be easily embodied so that they resist high loadings in particular on account of temperature and aggressive substances, such as for example as occur with motors.

[0016] Finally the invention envisages the fastening of an assembly part to a carrier part with at least one fastening screw, which comprises a screw head with engagement surfaces for a tool and collar, a screw shank, a further collar on the screw shank at a distance

from the screw head and a thread at least at the distance of the further collar from the screw head. Furthermore the fastening has a flexible assembly ring whose inner diameter is smaller than the outer diameter of the collars and which is arranged between the collars on the screw shank. Further to this there is present a through bore in the assembly part whose inner diameter is at least as large as the outer diameter of the further collar, into which the fastening screw is inserted, wherein the lower side of the collar is indirectly or directly supported on the upper edge region of the through-bore, wherein however the inner diameter of the through-bore is dimensioned such that the assembly ring is radially pressed together therein and by way of this is clamped in and/or the through bore comprises an undercut with a inner diameter so that the assembly ring under radial compression and subsequent expansion is pushed through the undercut and by which the assembly ring is retained in the through-bore. Finally the fastening has a threaded bore in the carrier part into which is screwed the thread of the fastening screw and on whose edge region the further collar is supported. With this fastening the collar and the further collar of the fastening screw assume essentially the function of the head flange and foot flange of the sleeve, which is done away with.

[0017] Particularities of the head flange and the foot flange from the dependent claims may in as far as is possible, be transmitted to the collar and the further collar of the fastening screw.

[0018] The invention is hereinafter described in more detail by way of the accompanying drawings of several embodiment examples. In the drawings there are shown:

- 35 Fig. 1 an assembly ring in the plan view (a) and a fastening to the assembly ring in the longitudinal section (b);
- 40 Fig. 2 an assembly ring with end sections for supporting a sleeve in an intermediate position in the plan view (a) and a fastening to the assembly ring in the intermediate position in the longitudinal section (b);
- 45 Fig. 3 an assembly ring with end regions of increased flexibility in the plan view (a) and a fastening to the assembly ring in an intermediate position in the longitudinal section (b);
- 50 Fig. 4 an assembly ring with inner projecting contact regions on the two ends in the plan view (a) and in a fastening in an intermediate position in a longitudinal section (b);
- 55 Fig. 5 a metallic assembly ring in the plan view (a) and in a fastening in the longitudinal section (b);

Fig. 6 an assembly ring in the plan view (a) and a fastening with the assembly ring and a collar screw in the longitudinal section (b).

[0019] In the Figs. 2 to 5 for reasons of simplification the carrier part is left out. In all drawings components corresponding to one another are indicated with the same reference numerals. The details to a reference numeral apply for all embodiment examples with the same reference numeral.

[0020] The fastening according to Fig. 1 has a fastening screw 10, a sleeve 20, an assembly ring 30, an assembly part 40 and a carrier part 50.

[0021] The fastening screw 10 has a head 11 which at the lower side has a radially projecting collar 12. From the screw head 11 there proceeds a screw shank 13 which comprises a knurling 14 which is at a distance to the screw head and which extends over the whole circumference: Up to the knurling 14 the screw shank 13 is formed smoothly cylindrical. The outer diameter of the knurling 14 which is taken on a circle laid by the outer ends of the knurling is larger than the smooth cylindrical region of the screw shank 13. On the side of the knurling 14 distant to the screw head 11 the screw shank 13 carries a thread 15 whose outer diameter is somewhat smaller than the outer diameter of the knurling 14. At the lower end the fastening screw 10 has a cylindrical introduction peg 16, whose outer diameter again is smaller than that of the thread 15.

[0022] The screw 10 is preferably manufactured from a metallic material wherein in particular the knurling 14 and the thread 15 may be rolled.

[0023] The sleeve 20 has a smooth cylindrical section 21, whose inner diameter somewhat exceeds the outer diameter of the knurling 14 so that a displacement of the fastening screw 10 in the sleeve 20 is possible without further ado. At the upper end of the smooth cylindrical section 21 the sleeve 20 on the inside has a narrow location in the form of a circumferential necking 22. In the longitudinal section the necking 22 is recognizable as a slightly bulged contour on the inner side of the sleeve 20. Its inner diameter, i.e. the diameter at the location of its smallest cross section, is smaller than the outer diameter of the knurling 14, but somewhat larger than the outer diameter of the smooth-cylindrical region of the screw shank 13. Preferably it is also somewhat larger than the outer diameter of the thread 15 so that this is not damaged on passage. In the region of the necking 22 and the knurling 14 there is practically no play present between the sleeve 20 and the fastening screw 10 so that the screw 10 can be tilted with respect to the sleeve 20 only negligibly.

[0024] At the upper end the sleeve has a radially outwardly projecting head flange 23 and at the lower end it comprises a radially outwardly projecting foot flange 24. The outer diameter of the head flange 23 is larger than the outer diameter of the foot flange 24.

[0025] The sleeve 20 is preferably likewise manufac-

tured of a metallic material, wherein the necking 22 as well as the head flange 24 may be manufactured by a shaping procedure. The latter at the same time may be manufactured by two beading procedures in opposite directions, by which means there results a doubling of the wall thickness. The sleeve 20 may however also be manufactured by swarf-producing machining, e. g. by turning.

[0026] The assembly ring 30 is formed smooth-cylindrically with bevelings 31, 32 at the upper and lower end. On its side it comprises a longitudinal slot 33 whose width slightly reduces towards its centre. The longitudinal slot with respect to its plane of cross section through its centre 34 is formed symmetrically. Its inner diameter somewhat exceeds the outer diameter of the middle section 21 of the sleeve 20, but is somewhat smaller than the outer diameter of the foot flange 24.

[0027] The assembly ring 30 is elastic. For the application with motors it may be designed resistant to oil and heating. It may be manufactured of an elastic material for example of a thermoplastic plastic, of an elastomer or thermoplastic elastomer. Basically it may consist of metal.

[0028] The assembly part 40 has a through-bore 41, whose inner diameter is somewhat larger than the outer diameter of the foot flange 24, but smaller than the outer diameter of the assembly ring 30 in the untensioned condition. Above, the through-bore 41 has an undercut 42 with an even smaller inner diameter. This is however so large that the foot flange 24 may be guided through, that on the other hand the head flange 23 does not fit through, but considerably overlaps the upper edge region of the through-bore 41. The inner diameter of the undercut 42 and the outer diameter of the assembly ring 30 are dimensioned such that the assembly ring on passing through is maximally pressed together so far radially that it bears on the outer side of the sleeve 20 or the two ends of the assembly ring 30 abut against one another.

[0029] The assembly part 40 may in particular consist of metal or of a plastic.

[0030] The assembly part 40 and the carrier part 50 abut against one another with plane sides.

[0031] The carrier part 50 has a threaded bore 51 which accommodates the thread of the fastening screw 10. The foot flange 24 may be supported on the upper edge region of the threaded bore 51. The length of the sleeve 20 and the through-bore 41 are matched to one another such that with a resting foot flange 24 the head flange 23 rests on the upper edge region of the through-bore 41 and the assembly part 40 is pressed between the head flange 23 and the carrier part 50 in a controlled manner.

[0032] This fastening is pre-mounted in that firstly the fastening screw 10 is pressed into the upper end of the sleeve 20 until the necking 22 snaps behind the knurling 14. Furthermore with the pre-assembly the assembly ring 30 is widened until it fits over the foot flange 24 of

the sleeve 20. Then it is pushed over the section 21 and springs together elastically. On account of its symmetry it need not be directed with certain ends above and below. This unit may then be pre-mounted with the assembly part 40 in that the sleeve 20 is inserted into the through-bore 41 and the assembly ring seated thereon is pressed in. If the assembly ring 30 has passed the undercut 42 it is untensioned somewhat. The undercut 42 and the remaining clamping then prevent the assembly ring 30 from exiting upwards out of the through-bore. On the other hand the head flange 23 prevents the sleeve 20 from falling out downwards out of the through bore 41. The pre-assembly is thus securely protected from an unintentional falling apart even when the assembly part 40 with the screw head 11 is transported downwards.

[0033] With the assembly of the assembly part 40 on the carrier part 50, the fastening screw 10 may telescope up to the abutment of the knurling 14 on the necking 22 and the sleeve 20 up to the abutment of the foot flange 24 on the assembly ring. On applying the assembly part 40 onto the carrier part 50 the lower end 16 of the fastening screw 10 may recede in the through-bore 41. This is particularly advantageous when the threaded bores 51 by displacement of the assembly part 40 must be "searched" on the carrier part 50 until the fastening screws with the introduction pegs 16 fall into the threaded bores 51, in particular when the assembly part 40 at several locations must be fixed in this manner.

[0034] Finally the fastening screw 10 is screwed into the carrier part 50 until its collar 12 exerts a sufficient clamping force onto the head flange 23 in order to tension the sleeve 20 with the carrier part 50 and the assembly part 40, between the head flange 23 and carrier part 50. The play between the sleeve 20 and the assembly ring 30 ensures the compensation of manufacturing tolerances and heat expansions.

[0035] A disadvantage of the previously mentioned play is however that the sleeve 20 with a telescoping may tilt in the assembly ring 30 and as a result of this the position of the screw head 11 is not exactly determined. In an automatic screw station it is therefore no longer ensured that the tool finds the screw head. Fig. 2 relates to a solution of this problem.

[0036] With this solution the assembly ring 30 above and below in each case has a smooth-cylindrical end section 34, 35 with a reduced diameter, wherein however the inner diameter of the assembly ring 30 is constant everywhere. In the shown intermediate position the assembly ring 30 is exactly snapped with its beveling 31 behind the undercut 42 of the through-bore 41 of the assembly part 40. The assembly ring is still pressed together somewhat so that it is retained in this position by a remaining clamping. With this the upper end section 34 above protrudes somewhat beyond the assembly part 40. The head flange 23 of the sleeve 20 is supported on the upper end section 34. As a result of

this the fastening screw 10, until its knurling 14 reaches the necking, may be slid somewhat higher than if the head flange 23 is seated on the upper side of the assembly part 40. As a result of this the introduction peg 16 of the fastening screw 10 may be completely pushed into the through-bore without the head flange 23 being lifted from its support on the upper end section 34 of the assembly sleeve 30. For this reason the sleeve 20 does not tilt and the screw head 11 is retained in a position which may be securely controlled also by an automatic screwing tool. On screwing, the assembly ring 30 is completely pressed into the assembly part.

[0037] The above fastening however only functions when it is directed more or less vertically before the screwing. Otherwise the sleeve 20 may tilt in the assembly ring 30. For differing applications, in particular the horizontal screwing case, there is the embodiment according to Fig. 3.

[0038] With this embodiment the assembly ring 30 above and below in each case has an axial circumferential slot 36, 37. Furthermore the assembly ring 30 on the outside at half the height has a circumferential annular groove 38. On the outside the assembly ring is dimensioned such that with a bending together of the "hook barb" defined by the slots 36, 37 and the groove 38 in the two end regions, it can be fixed in the through-bore 41. With this the annular groove 38 may just accommodate the undercut 42 in order to secure the assembly ring 30 in an intermediate position. The inner diameter of the assembly ring 30 is selected such that the sleeve 20 may be guided therein in a manner free of play and with a horizontal alignment does not tilt. As a result of this also in a horizontal screwing case the locating of the screw head 11 with a screwing tool is simplified.

[0039] If the screwing tool has located the screw head 11, the assembly ring 30 is completely pressed into the through-bore 41 on screwing in the fastening screw 10.

[0040] With the above embodiment example the pressing in of the assembly ring 30 may be made more difficult by the reduced flexibility in the middle region, where a fall cross section is present. Fig. 4 shows an embodiment which is suitable for a horizontal screwing case in which the pressing in of the assembly ring 30 is favoured by way of an increased flexibility. For this the assembly ring 30 at the upper and lower end in each case has inwardly projecting contact regions 39, 39'. The inner diameter of the contact regions corresponds roughly to the outer diameter of the section 21 of the sleeve 20 so that a displacement of the two parts to one another is possible, but not a tilting. The inner diameter of the assembly part between the contact surfaces 39, 39' is on the other hand larger than the outer diameter of the section 21.

[0041] The lower slant 32 favours the leading through of the lower contact region 39' through the undercut 42 of the assembly part 40. With an advancing pressing in, the assembly ring 30 deflects radially inwards between the contact regions 39, 39' until its annular groove 38

accommodates the undercut 42. Then the sleeve 20 is in turn supported so high that the fastening screw 10 with its introduction peg 16 with or without lifting the sleeve 20 can be engaged into the through-bore 41. A pivoting of the sleeve 20 with respect to the assembly ring 30 is prevented by the contact regions 39, 39' and by way of this the screwing is favoured. On screwing in, the assembly ring 30 again is completely pressed into the through-bore 41, until the slant 31 is arranged behind the undercut 42.

[0042] The Fig. 5 shows an embodiment form with an assembly ring 30 preferably of spring steel. The assembly ring 30 is formed barrel-shaped and likewise comprises a slot 33. It is manufactured in that a tape material is drawn through a matrix and subsequently rolled to a ring. This assembly ring 30 acts similarly to that in Fig. 4, since its concave inner contour at the upper and lower end forms supports 39, 39'. Such an assembly ring 30 may also consist of plastic.

[0043] Finally Fig. 6 shows an embodiment with a "collar screw" 10', which apart from the collar 12 at the lower side of the head 11 at the end of a smooth-cylindrical screw shank 13 comprises a further collar 17 from which in turn the thread 15 extends. The fastening screw 10' is fixed with the help of an elastic assembly ring 30 into a through-guide 41 of an assembly part 40. With this the inner diameter of the through-bore 41 is somewhat larger than the outer diameter of the further collar 17, but smaller than the outer diameter of the assembly ring 30 in the untensioned condition. Furthermore the through-bore 41 above has an undercut 42 with an even smaller inner diameter, which is however so large that the further collar 17 may be guided through, but on the other hand the collar 12 cannot pass through, but considerably overlaps the upper edge region of the through-bore 41. On the passage through the undercut 42 the assembly ring 30 is maximumly pressed radially so far together that it bears on the outer side of the screw shank 13 or its two ends abut against one another. If the assembly ring 30 has passed the undercut 42 it untensions somewhat and is rigidly seated in the through-bore 41 below the undercut 42 in a secured position. The further collar 17 is supported on the non-shown carrier part and the assembly part 40 is clamped rigidly between the collar 12 and the carrier part.

## Claims

1. A fastening of an assembly part (40) on a carrier part (50) with
  - at least one fastening screw (10) which comprises a screw head (11) with engaging surfaces for a tool, a screw shank (13), at least one radial projection (14) on the screw shank (13) at a distance from the screw head (11) and a thread (15) at least at the distance of the

radial projection (14) from the screw head (11), with a sleeve (20) with an inner diameter which corresponds at least to the outer diameter of the radial projection (14) and of the thread, which is a narrow location (22) with an inner diameter smaller than the diameter of the radial projection (14) but at least as large as the outer diameter of the screw shank (13) between the screw head (11) and the radial projection (14), and which at the upper end comprises a head flange (23) and at the lower end a foot flange (24) into which the fastening screw (10) is inserted, wherein the narrow location (22) is snapped over the radial projection (14) of the fastening screw (10) and the screw head (11) is allocated to the outer side of the head flange (23).

- with a flexible assembly ring (30) whose inner diameter is smaller than the outer diameter of the head flange (23) and foot flange (24) and which is arranged between the head flange (23) and foot flange (24) on the sleeve (20),

- with a through-bore (41) in the assembly part (40) whose inner diameter is at least as large as the outer diameter of the foot flange (24), into which the sleeve (20) is inserted, wherein the lower side of the head flange (23) is indirectly or directly supported on the upper edge region of the through-bore (41), wherein however the inner diameter of the through-bore (41) is dimensioned such that the assembly ring (30) is radially pressed together therein and by way of this clamped in and/or the through-bore (41) comprises an undercut (42) with an inner diameter so that the assembly ring (30) under radial compression and subsequent expansion is pushed through the undercut (42) and by which the assembly ring is retained in the through-bore (41), and

- with a threaded bore (51) in the carrier part (50), into which is screwed the thread (15) of the fastening screw (10) and on whose edge region the foot flange (24) of the sleeve (20) is supported.

2. A fastening according to claim 1, with which the radial projection (14) is formed separately from the thread (15).
3. A fastening according to claim 2, with which the radial projection comprises a knurling (14) on the screw shank (13).
4. A fastening according to one of the claims 1 to 3, with which the screw shank (13) at its end opposite the screw head (10) comprises a cylindrical introduction peg (16) with a smaller outer diameter than the thread (15).

5. A fastening according to one of the claims 1 to 4, with which the screw head (11) below contains a radially projecting collar (12).
6. A fastening according to one of the claims 1 to 5, with which the distance of the lower side of the head flange (23) from the lower side of the foot flange (24) is somewhat smaller than the length of the through-bore (41) of the assembly part (40) in order to effect a pressing of the assembly part (40) between the head flange (23) and the carrier part (50).
7. A fastening according to one of the claims 1 to 6, with which the distance of the lower side of the head flange (23) from the lower side of the foot flange (24) is somewhat larger than the length of the through-bore (41) and between the head flange (23) and the assembly part (40) there is arranged an elastic intermediate position in order to effect a pressing of the assembly part (40) between the intermediate position and the carrier part (50).
8. A fastening according to one of the claims 1 to 7, with which the assembly ring (30) is shorter than the distance between the head flange (23) and the foot flange (24) and the sleeve (20) is displaceably arranged in the assembly ring (30).
9. A fastening according to claim 8, with which the fastening screw (10), sleeve (20), assembly ring (30) and through-bore (41) are dimensioned such that with the radial projection (14) bearing on the necking (22) snapped thereover and the foot flange (24) bearing on the assembly ring (30) the fastening screw (10) does not protrude below out of the through-bore (41).
10. A fastening according to one of the claims 1 to 9, in which the sleeve (20) is arranged in the assembly ring (30) with slight play.
11. A fastening according to one of the claims 1 to 10, in which the assembly ring (30) comprises a longitudinal slot (32).
12. A fastening according to one of claims 1 to 11, with which the assembly ring with respect to a centre cross sectional plane is symmetrical.
13. A fastening according to one of the claims 1 to 12, with which the assembly ring (30) is elastic.
14. A fastening according to one of claims 1 to 13, with which the assembly ring (30) is of plastic, elastomer and/or metal.
15. A fastening according to one of claims 1 to 14, with which the assembly ring (30) has an end section (34, 35) which in an intermediate position of the assembly ring (30) protrudes above out of the passage bore (41) and on which the head flange (23) is supported, wherein the fastening screw (10), sleeve (20) assembly ring (30) and through-passage (41) are dimensioned such that the fastening screw (10), with the bearing of the radial projection (14) on the narrow location (22) snapped thereover, does not protrude beyond the lower end of the through-bore (41).
16. A fastening according to one of the claims 1 to 15, with which the assembly ring (30) proceeding from both end faces comprises axial circumferential slots (36, 37) which at both ends delimit regions of higher flexibility which permit a clamping in the through bore (41).
17. A fastening according to one of the claims 1 to 16, in which the inner diameter of the assembly ring (30) is roughly equal to the outer diameter of the sleeve (20) between the head flange (23) and the foot flange (24).
18. A fastening according to one of the claims 1 to 17, with which the assembly ring (30) at the upper and lower end comprises radially inwardly projecting contact regions (39, 39') whose inner diameter corresponds roughly to the outer diameter of the sleeve (20) between the flanges (23, 24), with which the assembly ring is supported on the sleeve (20) between the head flange (23) and the foot flange (24) and between which the assembly ring can be radially compressed.
19. A fastening according to one of claims 1 to 18, with which the through-bore (41) at the upper end comprises an undercut (42) through which the assembly ring (30) under radial compression and subsequent expansion is pushed.
20. A fastening according to one of the claims 1 to 19, with which the assembly ring (30) externally comprises an annular groove (38).
21. A fastening according to claim 19 and 20, with which the assembly ring (30) in an intermediate position can be fixed with the annular groove (38) on the undercut (42), wherein the assembly ring partly protrudes out of the upper end of the through bore (41) and keeps the head flange (23) at a distance from the assembly part (40).
22. A fastening of an assembly part (40) onto a carrier part (50) with at least one fastening screw (10'), which com-

- prises a screw head (11) with engagement surfaces for a tool and a collar (12), a screw shank (13), a further collar (17) on the screw shank (13) at a distance from the screw head (11) and a thread (15) at least at the distance of the further collar (17) from the screw head (11),
- with a flexible assembly ring (30) whose inner diameter is smaller than the outer diameter of the collars (12, 17) and which is arranged between the collars (12, 17) on the screw shank (13),
  - with a through bore (41) in the assembly part (40) whose inner diameter is at least as large as the outer diameter of the further collar (17), into which the fastening screw (10) is inserted, wherein the lower side of the collar (12) is indirectly or directly supported on the upper edge region of the through bore (41), wherein however the inner diameter of the through bore (41) is dimensioned such that the assembly ring (30) is radially pressed together therein and by way of this is clamped in and/or the through-bore (41) comprises an undercut (42) with an inner diameter so that the assembly ring (30) under radial compression and subsequent expansion is pushed through the undercut (42) and by which the assembly ring is retained in the through-bore (41), and
  - with a threaded bore (51) in the carrier part (50), into which is screwed the thread (15) of the fastening screw (10) and on whose edge region the further collar (17) is supported.
23. A fastening according to claim 22 and one of the claims 1 to 21, wherein the collar (12) replaces the head flange (23) and the further collar (17) replaces the foot flange (24) of the sleeve (20).

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Fig. 1

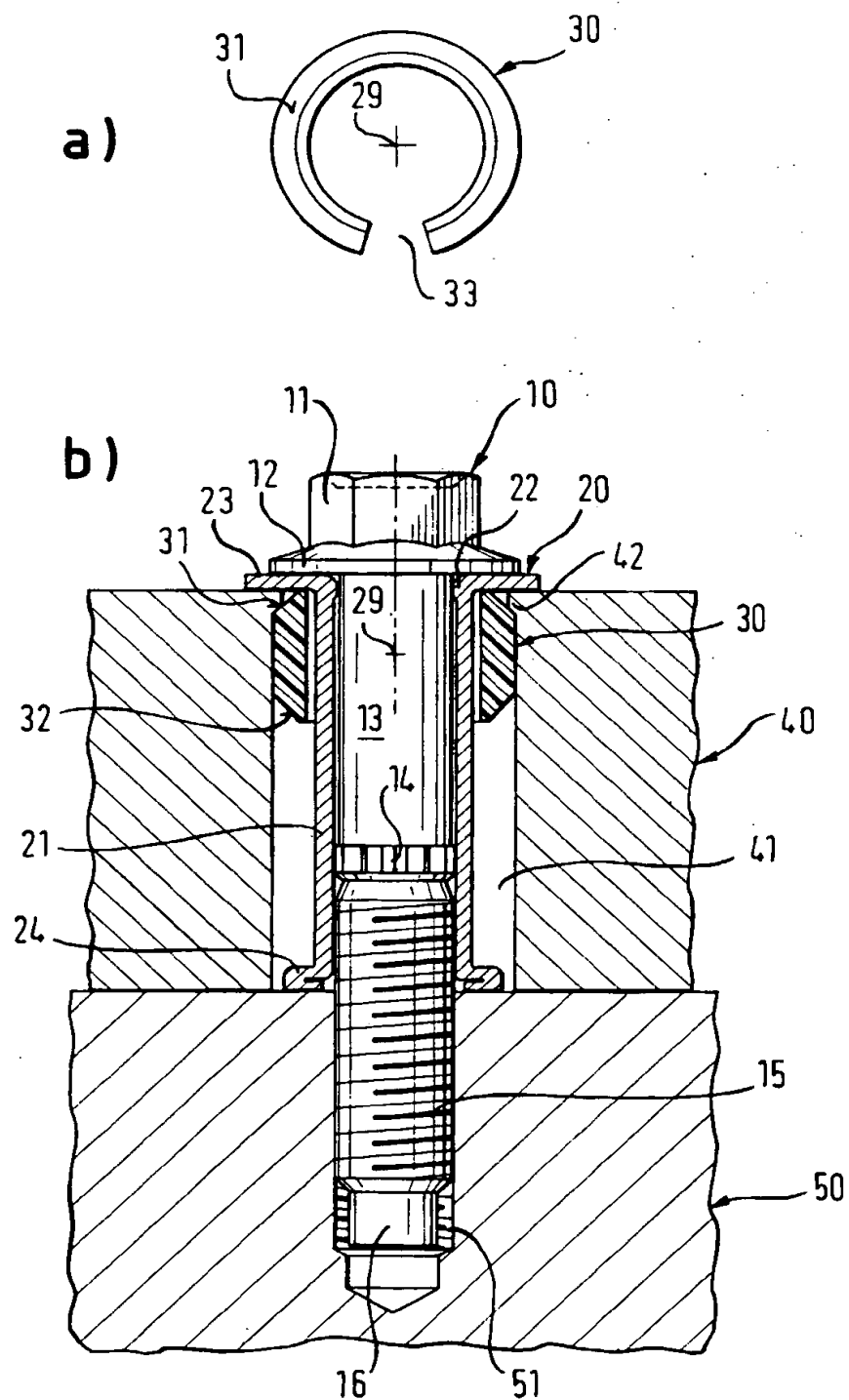


Fig. 2

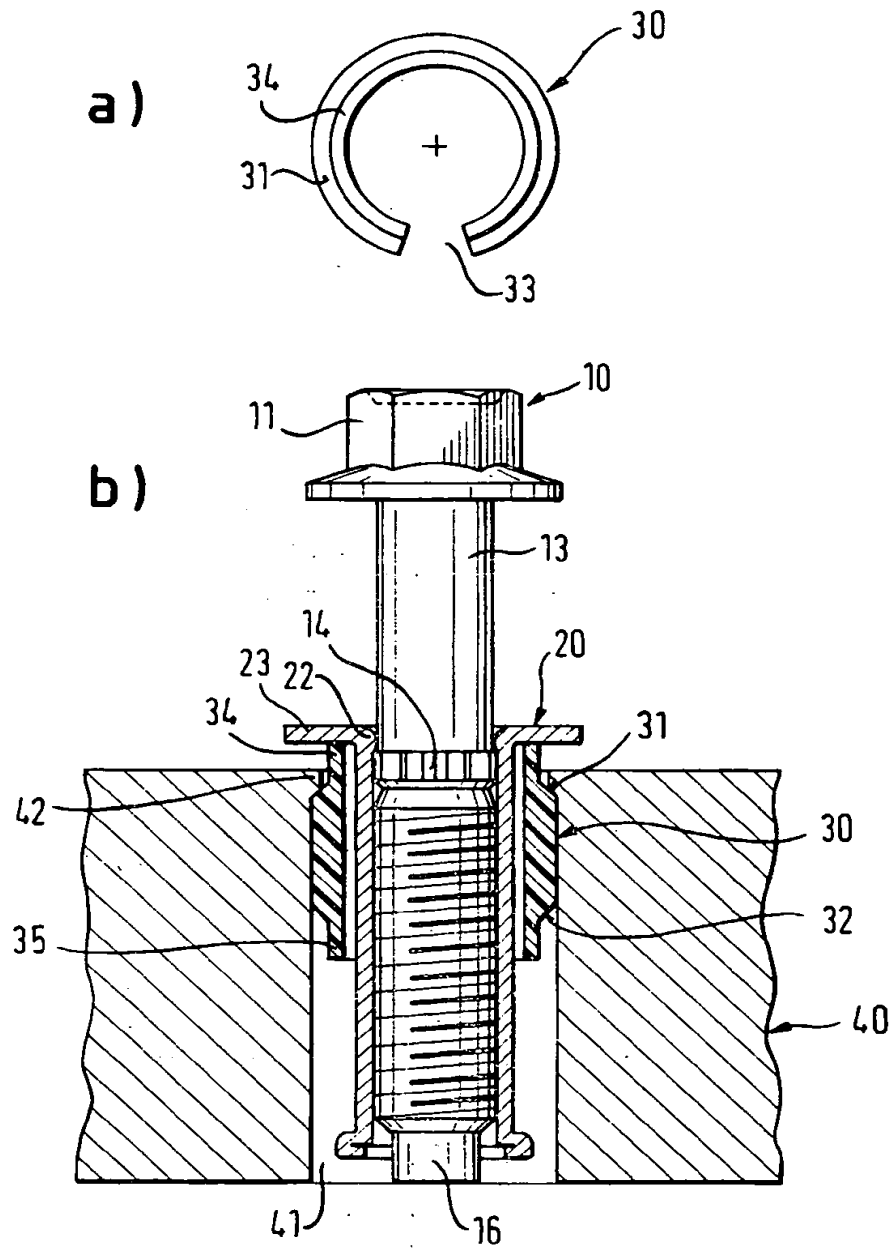


Fig. 3

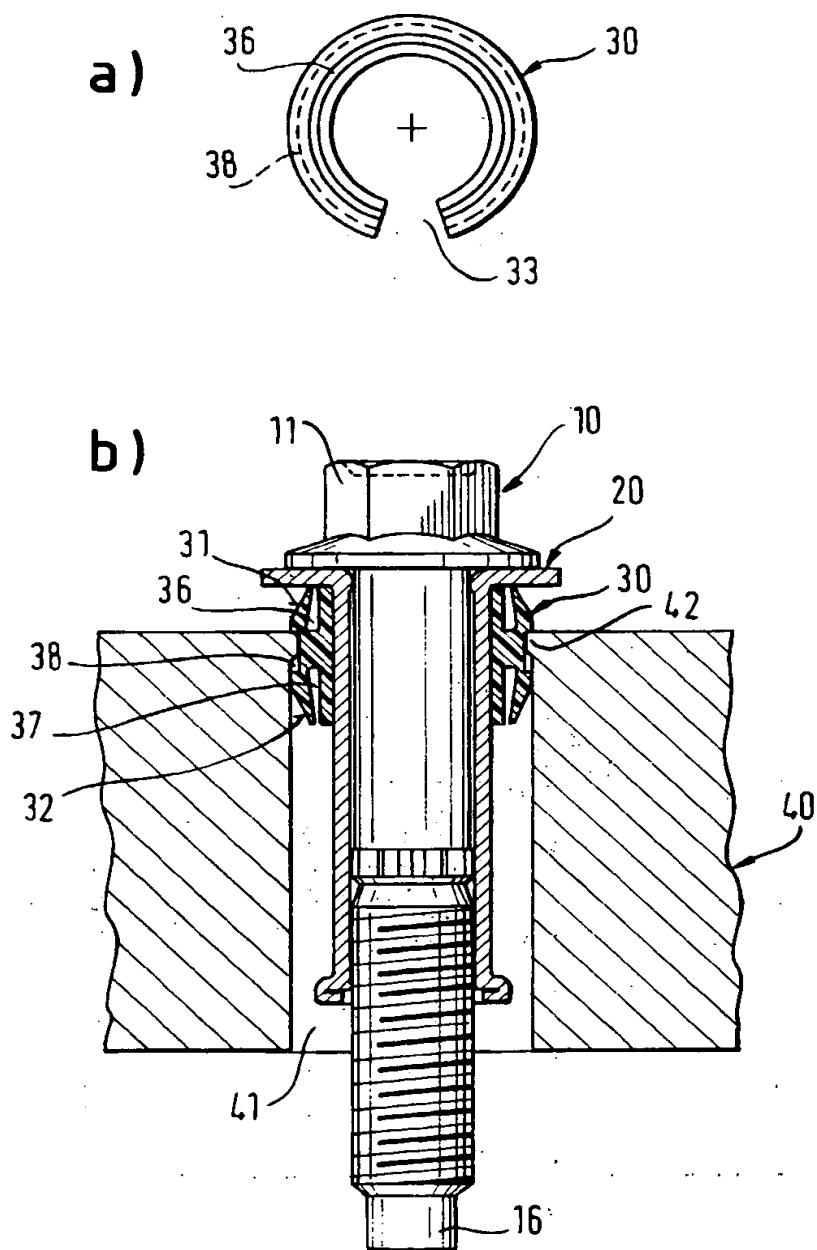


Fig. 4

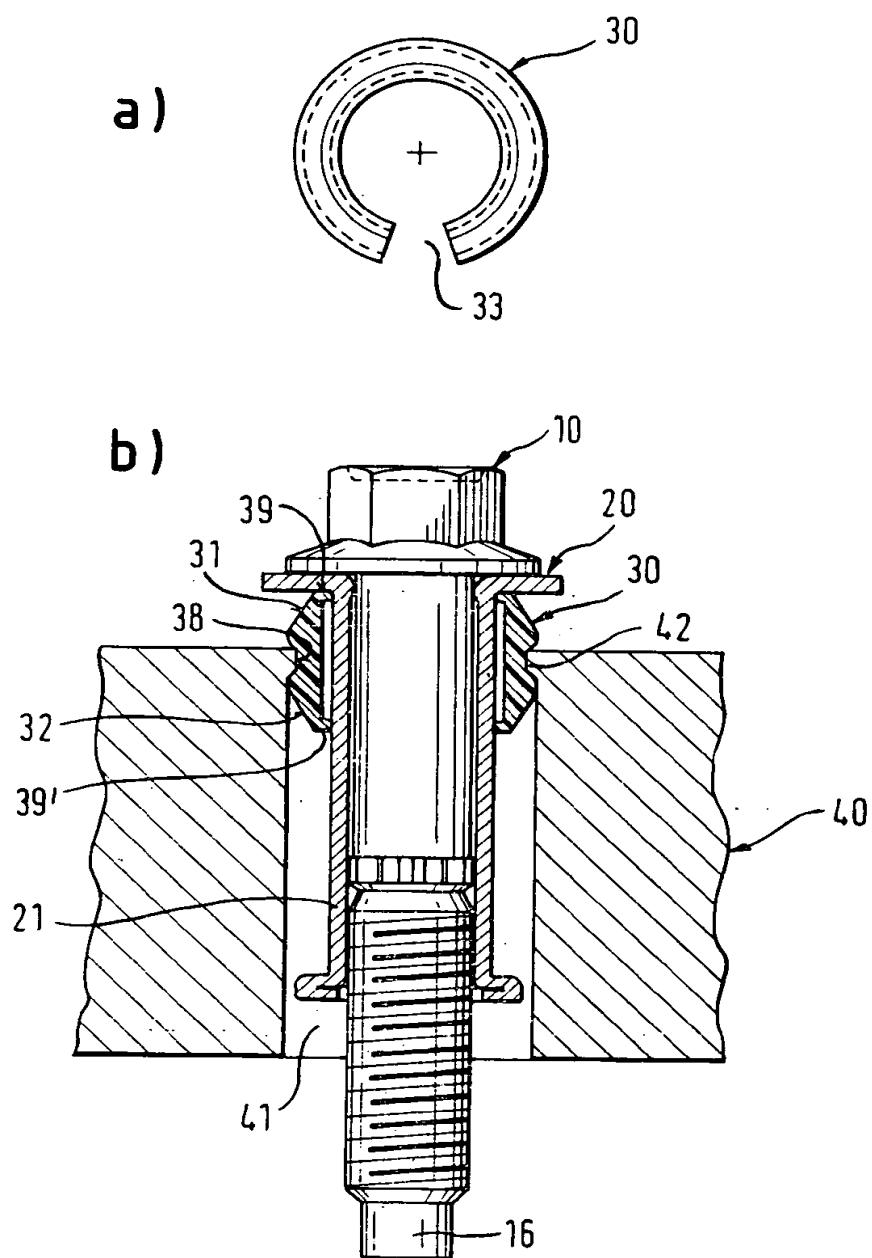


Fig. 5

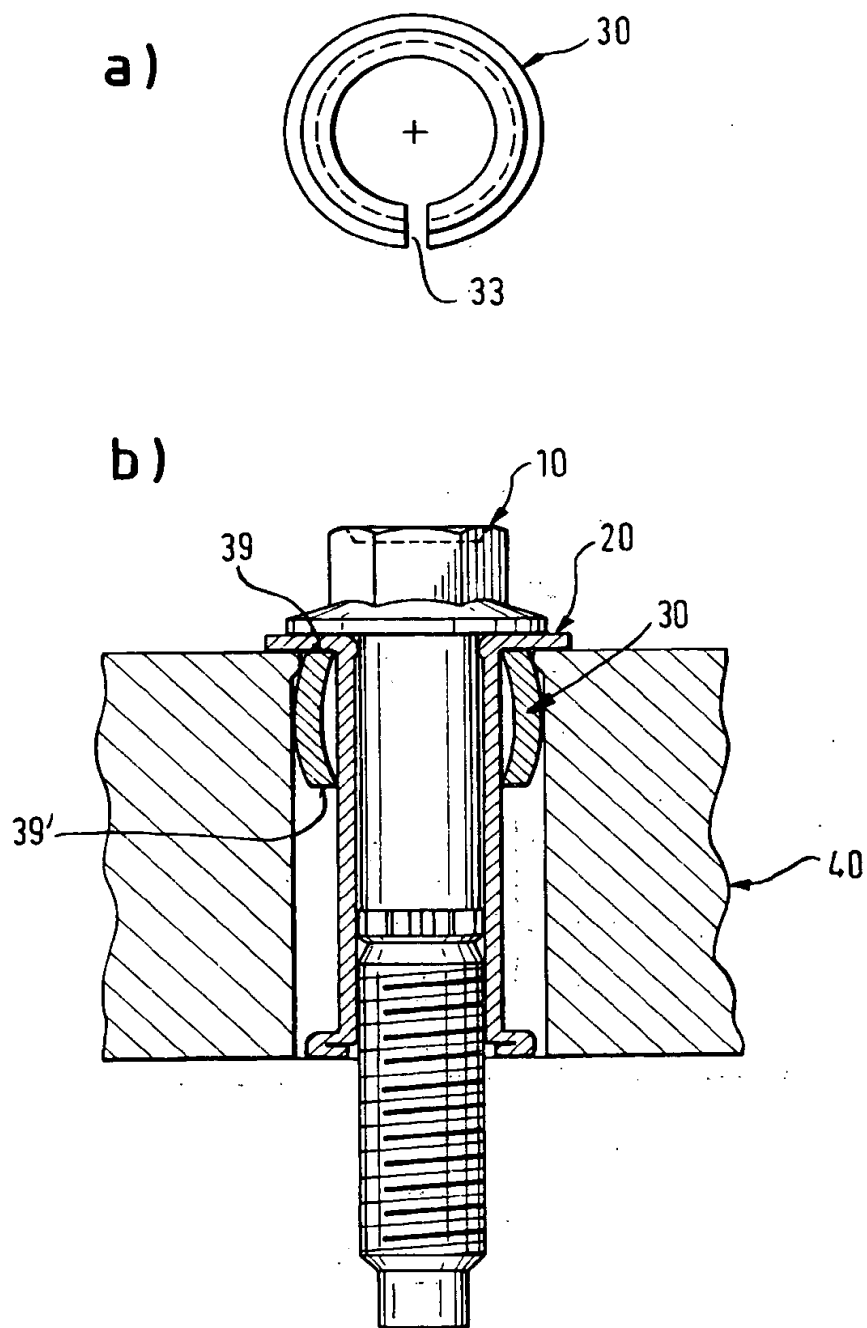
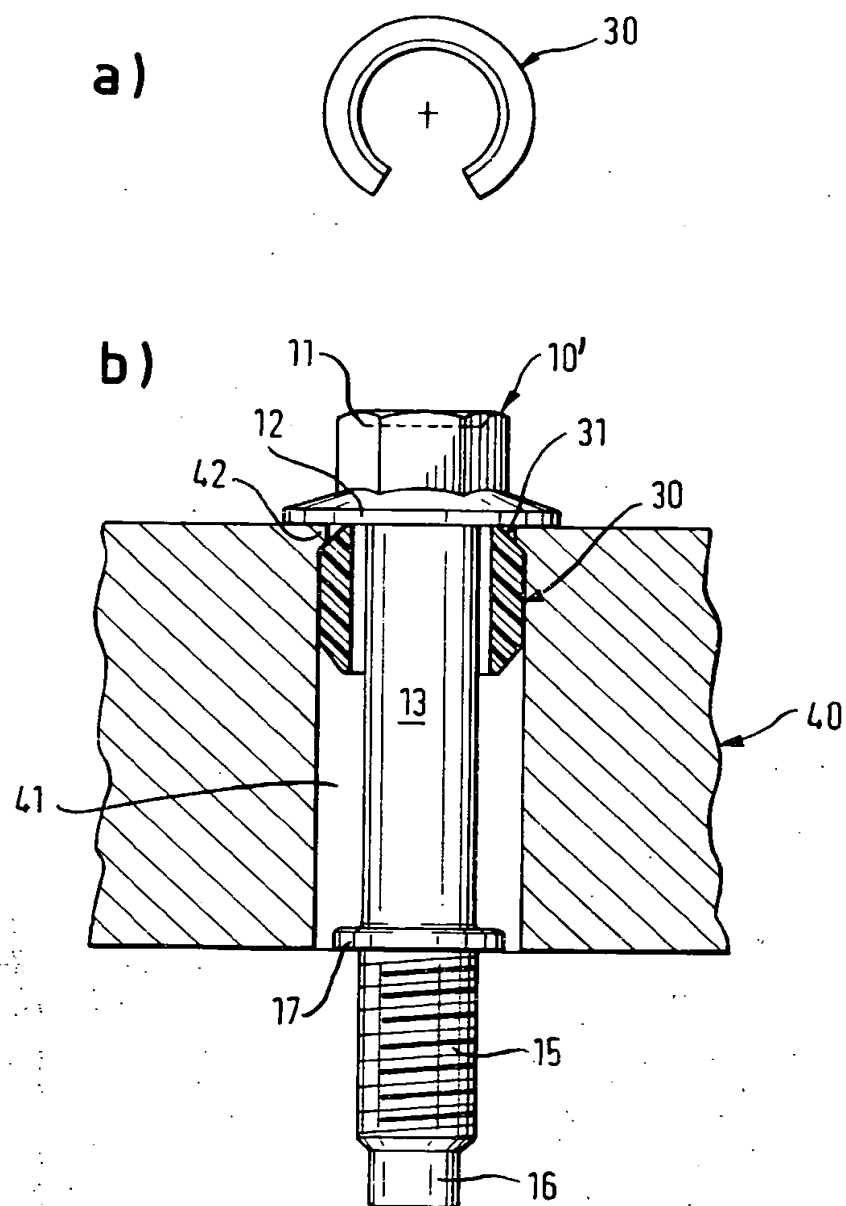
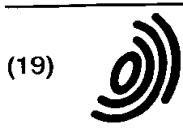


Fig. 6





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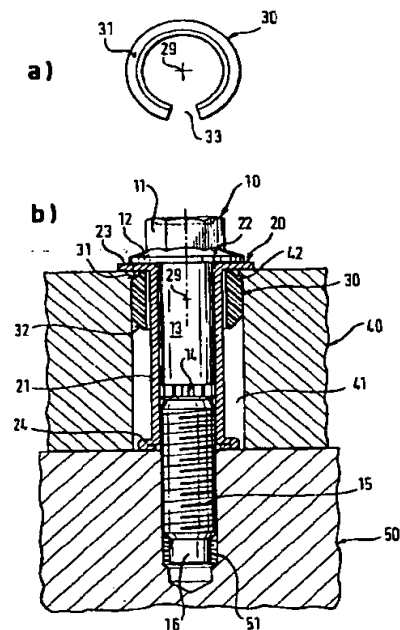
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(54) **A fastening of an assembly part onto a carrier part**

(57) A fastening of an assembly part (40) on a carrier part (50) with

- at least one fastening screw (10) which comprises a screw head (11) with engaging surfaces for a tool, a screw shank (13), at least one radial projection (14) on the screw shank (13) at a distance from the screw head (11) and a thread (15) at least at the distance of the radial projection (14) from the screw head (11),
- with a sleeve (20) with an inner diameter which corresponds at least to the outer diameter of the radial projection (14) and of the thread, which is a narrow location (22) with an inner diameter smaller than the diameter of the radial projection (14) but at least as large as the outer diameter of the screw shank (13) between the screw head (11) and the radial projection (14), and which at the upper end comprises a head flange (23) and at the lower end a foot flange (24) into which the fastening screw (10) is inserted, wherein the narrow location (22) is snapped over the radial projection (14) of the fastening screw (10) and the screw head (11) is allocated to the outer side of the head flange (23).

Fig. 1



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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	EP 0 272 642 A (ILLINOIS TOOL WORKS) 29 June 1988 (1988-06-29) * column 2, line 53 - column 5, line 25; figures *	1,2,4,5, 12-14,18	F02F1/24 F16C19/00 F02F7/00 F16B41/00
A,P	US 5 807 052 A (JONES JR JAMES D ET AL) 15 September 1998 (1998-09-15) * column 3, line 43 - column 6, line 26; figures *	1-5,7	
A	US 5 711 711 A (SCHMIDT JR RUDOLPH) 27 January 1998 (1998-01-27) * column 3, line 54 - column 10, line 22; figures *	1-5,7	
A	US 5 462 395 A (DAMM KLAUS ET AL) 31 October 1995 (1995-10-31) * column 6, line 48 - column 10, line 55; figures *	1-3,22, 23	
A	EP 0 524 750 A (ILLINOIS TOOL WORKS) 27 January 1993 (1993-01-27) * page 3, line 35 - page 5, line 17; figures *	1-3,22, 23	TECHNICAL FIELDS SEARCHED (Int.Cl.5)  F02F F16B
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>22 March 2000</b>	Examiner <b>von Arx, H</b>
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EP 99 10 2565

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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22-03-2000

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0272642	A	29-06-1988	US 4732519 A	22-03-1988
			AU 8294187 A	30-06-1988
			BR 8707044 A	02-08-1988
			CA 1307954 A	29-09-1992
			DE 3784325 A	01-04-1993
			JP 2003721 C	20-12-1995
			JP 7023726 B	15-03-1995
			JP 63199913 A	18-08-1988
			MX 168712 B	04-06-1993
US 5807052	A	15-09-1998	CA 2240383 A	27-12-1998
			EP 0892183 A	20-01-1999
			JP 11072112 A	16-03-1999
US 5711711	A	27-01-1998	US 5489177 A	06-02-1996
			US 5662444 A	02-09-1997
US 5462395	A	31-10-1995	DE 4310002 C	21-04-1994
			AT 146573 T	15-01-1997
			CZ 9400321 A	19-10-1994
			EP 0618385 A	05-10-1994
			ES 2097564 T	01-04-1997
			JP 7005886 A	10-01-1995
EP 0524750	A	27-01-1993	US 5154559 A	13-10-1992
			AU 632013 B	10-12-1992
			CA 2073731 A	26-01-1993
			JP 5196026 A	06-08-1993
			US 5199152 A	06-04-1993

EPO FORM P0489

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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